

Inter-dependency of Forest Diversity and Service towards the Potency of Economic Development in Pegunungan Arfak Natural Reserve

by Lukas Y. Sonbait

Submission date: 07-Jun-2020 08:02PM (UTC+0300)

Submission ID: 1339434382

File name: publikasi_Inter-dependency_of_forest_div.pdf (168.42K)

Word count: 2692

Character count: 14977

Inter-dependency of Forest Diversity and Service towards the Potency of Economic Development in Pegunungan Arfak Natural Reserve

Lukas Yowel Sonbait¹, Hermanus Warmetan², Hotlan Manik¹ and Reinardus Liborius Cabuy^{2*}

¹Faculty of Animal Husbandry, University of Papua, Manokwari, Indonesia 98314.

²Department of Forestry, Faculty of Forestry, University of Papua, Manokwari, Indonesia 98314.

*Corresponding author

Abstract

Forest as a complex ecosystem possesses a number of services for living. Inter-dependency among various components in the ecosystem will generate benefits and long-term existences. This study aims to understand the potential forest and environmental resources for sustainability and economic development by way of forest diversity assessment. Plot samples in both villages, Mokwam and Syoubri, were designed to reveal forest structure and diversity through importance value and Shannon wiener index scores. To understand correlation between traditional willingness with the gardens, agricultural lands, and forest resources, ANOVA one-way test was performed. Principle component analysis was applied to display correlation among intent use, benefited value, accessibility, and sustainability through scoring. Result indicated forest diversity in both areas was quite diverse indicated by importance value and Shannon wiener index. Interaction between people and land resources was very significant ($R^2 = 0.79$) and significant ($R^2 = 0.49$) in both, Mokwam and Syoubri, respectively. PCA analysis pointed out a very positive correlation between intent use and benefited value, while negative correlation indicated from the correlation between intent use and sustainability.

Key words: Economic income, forest diversity, intent use, sustainability, traditional people.

Introduction

Economic development is an important indicator to achieve a better life. Stimulating economic growth will benefit people by way of fulfilling all necessities of the daily needs either direct or indirect that possibly for the long run will be available (Goodwin et al. 2008; FAO 2017). With an equal distribution of economic incomes generated in whole areas, it turns out to be a pivotal indicator for sustainable economic growth and simultaneously scales up national status and alleviate gap of economic difficulty.

Forest as a whole complex ecosystem possesses tremendous resources not only as a dominant contributor of timber and non-timber forest products (NTFP's), but more than that it has been abundantly beneficial for its services (Toman 2003; Artim et al. 2008). Traditional life along the tropical regional have long been resourceful with forest services provided over generations. Through forest services, millions of benefits can be generated and

those eventually will scale up traditional living paradigm and invigorate small-scale economic activities around traditional communities (Elliott II et al. 2007). There are a number of services forest can provide such as tourism park, playing ground and outbound arena, hacking, camping, and bird sing service. Those are tangible resources that can be added as a potential chunk of income and economic boost for local people.

Papua Island has been prominent as one of the unique regions in Indonesia, representing a well-functioning natural environment and forest ecosystem, considering as a rich region with the high abundance of flora and fauna as a complexity of natural life cycle exist (van Heist et al. 2010). Noting, there are more than 20,000 vascular plants, 3,000 orchid species, insects exceed 200,000 species, and 164 species of amphibians are found there. Papuan forests are concerned as the most completed and representative vegetation types from the highland to the coastal ecosystem in the tropics (Takeuchi et al. 2003; Beehler, 2007).

As a long-run manifestation of natural resource existence, forest in Papua has been home for more than thousands of living organisms from small insects up to the large-size mammals (Beehler, 2007). Interaction with the forest will be undoubtedly fundamental due to intense interdependency. As a home, forest provide a tangible benefit such as daily food, water, habit for living and many more that potentially exist as a synergic circumstance (Cabuy et al. 2012). Such good and balanced ecosystem, will gain a potential development of forest services and eventually boost local economic activity and drive income allocation among traditional communities (Lekitoo et al. 2017). Therefore, this study want to highlights the importance of forest as a home towards the existence of forest services provided which untunately invigorate small-scale economic adaptability for the local communities.

20

Materials and Methods

Study site

This study taken place in two villages, Mokwam and Syoubri, the administrative area of Warmare, Manokwari during May to July 2016. In general, the area is situated in the high land ranging from 1,200 m to the 2,000 m amsl. A number of areas were dominated by mountain and hills with slope up to the 75°. The area was wetter indicated by a high intensity of annual rainfall ranges from 1500 to 2000 mm/year. The average temperature was 27.7° C and the relative humidity of 84.3 % (BMKG 2016). Soil type was dominated by entisol with a rough texture and low organic and nitrogen compound. A small portion covered by sandy and dusty.

Plot and sample design

Several study plots were designed to see forest cover, structure, and density in both Mokwam and Syoubri villages. Systematic line plot sampling was applied with a length of baseline of 1 km with 100 m interval, therefore there are 10 sampling plots for tree inventory. In total, there were four baseline created in both selected forested villages. Besides, gardens were identified in order to get an overall information regarding potential income generated from forest and surrounding gardens. Garden was identified through field study and data collected such as how many gardens, how big it is, what is the importance of it for supporting daily living income. In order to obtain those data, some selected key people were asked through questionnaire around the relationship with the forest and its socio-economic interaction. For the sustainability, four key aspects such as forest use intensity, value, accessibility towards forest resources, and the future sustainability were being recorded. Those were converted into the scoring rate from 1 (very less) to 10 (very often).

Socio-cultural aspect

Population in both villages was slightly different of which Mokwam was higher (257 people) than Syoubri (74 people). Questionnaire data taken by purposively selecting key respondents (10 % of the total population) from two villages who have agricultural lands, customary right owners, and public figure for gaining a better understanding of forest and natural resource uses. Therefore, 26 respondents ($n = 26$) were selected from Mokwam and 7 respondent ($n = 7$) chosen from Syoubri. These selected respondents then participated in the whole discussions process and data collections during this study.

Data Analysis

Forest vegetation were identified taxonomically in each sampling plot. These then calculated to get importance value index for understanding dominance of tree species and Shannon Wiener Index for the diversity value of tree species in the four selected baselines. ANOVA was test to see the correlation between family member and how often the family interacted with their gardens, agricultural lands, and forest resources for living. In addition to understanding the correlation among forest use intensity, value, accessibility towards forest resources, and the future sustainability, principle component analysis (PCA) was performed using Vegan package. All data calculated using R statistical program 3.4.3. (R Development Core Team 2017).

Results

ANOVA one-way test for the correlation between number of families and frequency of interaction with their garden, agricultural lands, and forest resources to fulfil daily basic needs indicating very significant in Mokwam with a *P-value* of 0.03 and $R^2 = 0.79$, while correlation was significant in Syoubri with the *P-value* of 0.26 and $R^2 = 0.49$ (Fig. 1). In general, those relationship showed a positive indication of how intense traditional villagers toward their gardens, agricultural lands, and forest resources in conjunction with the fulfilment of basic daily necessities. From those tyoes of internations, it was found that a huadful of hasvesting products from gardens, agricultural lands, and forest resources were sold primarily to the market in order to scale up livelihood incomes. It was ovioius that generating economic acitovies in the communitas has been exist in both villages.

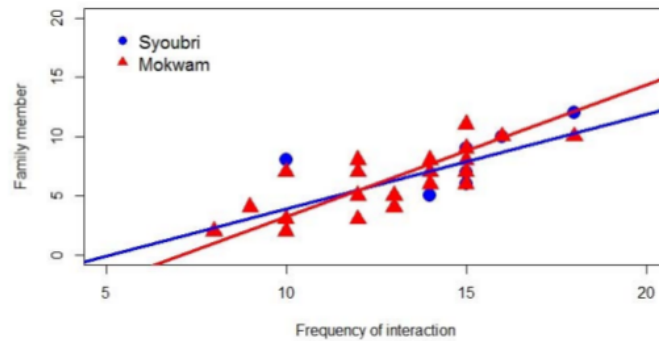


Figure 1. Multiple correlations describing number of family member towards how intenet their interaction with garden, agricultural lands, and forest resoures in both villages, Mokwam and Syoubri.

Vegetation analyses revelaed than there were 45 tree species found in Mokwam with the five dominant trees such as *Psicotris* sp., *Garcinia* sp., *Ardisia* sp., *Poteria* sp., and *Helisia* sp. On the other hand, 35 were identified in Syoubri with the five dominant trees such as *Psicotria* sp., *Calophilum prostanum*, *Polysias* sp., *Protea* sp., and *Pouteria* sp. *Psicotris* sp., turned out to be the most dominant tree species found in both forested areas which indicated by the highest score of importance value index and shannon wiener index of 14.61 and 0.09 in Mokwan and 17.38 and 0.10 respectively in Syoubri.

Principle component analysis revealed the correlation among frequency of ineteraction, accessibility, benefited value, and sustainable future of gardens, agricultural lands, and foret resources in both areas. In was indiated positive correlation between

frequency of interaction and benefited value in both villages (Fig. 2). However, negative correlation seen between the correlations between frequency of intensity and sustainable future. It was slightly that the availability of sources was gradually will be vanished and it will decrease the potential distribution and availability in both areas. In addition, the correlation between frequency of intensity and access were slightly negative and it will be more difficult for the long period as the intensity of use is massive (Fig. 2).

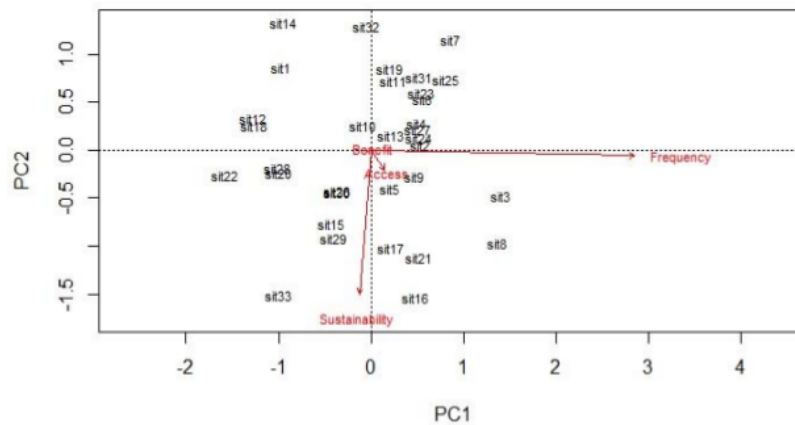


Figure 2. PCA indicated multiple correlations among how often the interaction occurred, what was the benefit gathered, the accessibility towards resources, and sustainability for the future.

Discussion

Trend of forest cover

Surrounding forests in Mokwam and Syoubri were still in the good shape in terms of resources and biodiversity values. Noticed that forest structure were distributed normally from seedlings up to the trees. In addition to the density, it was seemed that both had a medium forest density per hectare with more than 200 trees found that covered by more than 30 tree species. Forest canopy cover was also high in some tree structures which revealed a general normal distribution and less disturbing factors affected. Shannon index was relatively medium pointed out the diversity in both forested areas was still high. There were several factors indicating the forest area in the good shape such as natural landscape in which a handful of them were in the slope areas which was difficult to access and accopy. Small-scale use of forest resources was another indicator of sustainability in those areas (Ruitenbeek and Cartier1998; May et al. 2017). Traditional villagers extracted forest

resources just for daily needs which was a small portion with a low intensity. 'Forest as a mother' terms was a pivotal key in generating understanding of how important forest existence in the socio-cultural aspect of villagers in the area (Meyer et al. 2003). The terms then preserve the forest and its resource to be used in the appropriate way. However, there were still forest disturbance activities, uncontrolled fires, unintended natural destructions, and some atropigenic activities were actively getting involved and changed the structure and composition of the surrounding forests. Small-scale forest activities such as chopping trees and branches were still occurred in the forest intended for daily needs and housing constructions. Several fires were also happened during dry season in some spots on account of the conventional land burning management for agricultural purpose (Karki 2002; Pivello 2011). The cascade of floods and landslides reportedly occurred which potentially diminish bio-diversity and tree species richness in the area that considered as one of the natural reserve regions in Indonesia. It turned out that garden opening in the sloping areas was the main driving factor of landslide occurred.

Forest service and ecotourism potential development

Given that forest lands in Mokwam and Syoubri were well-functioned and in the good shape, that is indicating a potential service will render for thousands of living organisms inside the forest. Not merely timber and its derivative products, but more than that services and attractions were potentially thrived as a solution for generating an additional income (FAO 2016). Considering the forest was likely contained dense diversity forest (based on shannon and importance index scale), it will generate complex species interactions and competition among thousand of living organisms and possibly contribute towards the enhancement of endemic floral and faunal species (Anand et al. 2010). Very significant ($R^2 = 0.79$) and significant ($R^2 = 0.49$) correlations toward forest resources availability indicating how important forest was for their living including natural water, recreational object, place for playing, and learning. Beside a linear contribution provided for people, a balanced ecosystem will pertain ecological aspect of biodiversity with a tangible potency to be sold out such as variety of endemic faunal and unique flora such as famous bird-fly butterfly (*Ornithoptera* spp.) Arfak paradise (*Astrapia nigra*), Parotia barat (*Parotia sefilata*), and Namdur polos (*Amblyornis inornatus*), as well as various species of Orchidacea and flowering plants. Those endemisms had been contributed economically in the traditional communities and had an impact on the economic development.

References

- Anand M, Gonzalez A, Guichard F, Kolasa J and L Parrott. 2010. Ecological systems as complex systems: Challenges for an emerging science. *Diversity*, 2:395-410.
- Artim E, Baltzar E, Fiedler J, Sevic D, Zhechkov R. 2008. Investing in the environment as a way to stimulate economic growth and employment. Working document, Regional Environmental Center, 61 pp.
- Beehler B. 2007. Introduction to Papua. In *The Ecology of Papua: Part One*, vol. 6 of *The Ecology of Indonesia Series*, edited by A. J. Marshall and B. M. Beehler. Singapore: Periplus Edition.
- Cabuy RL, Marwa J, Manusawai J, Rahawarin YY. 2012. Non-woody plant species of Papuan Island forests, A sustainable source of food for the local communities. *Indian Journal of Traditional Knowledge*, 11(4): 586-292.
- Elliott II VM, Hartarska V and Bailey C. 2007. Natural resources endowment and economic growth in the Southern United States. Selected paper prepared for presentation at the American Agricultural Economics Association Annual Meeting, Portland, OR, July 29-August 1, 2007.
- FAO. 2016. Forest and farm producer organizations – Operating systems for the SDGs. The Food and Agriculture Organization of the United Nations and AgriCord, 46 pp.
- FAO. 2017. The future of food and agriculture – Trends and challenges. Rome, 163 pp.
- Goodwin N, Nelson JA, Ackerman F, Weisskopf T. 2008. Consumption and the consumer society. A GDAE Teaching module, Global Development and Environmental Institute, Tufts University, 21 pp.
- Karki S. 2002. Community involvement in and management for forest fires in South East Asia. Project FireFight South East Asia, IUCN. 39 pp.
- Lekitoo K, Peday HFZ, Panambe N, Cabuy RL. 2017. Ecological and ethnobotanical facet of 'Kelapa Hutan' (*Pandanus* spp.) and perspectives towards its existence and benefit. *International Journal of Botany*, 13: 103-114.
- May N, Guenther E and P Haller. 2017. Environmental indicators for the evaluation of wood products in consideration of site-dependent aspects: A review and Integrated approach. *Sustainability*, doi:10.3390/su9101897.
- Meyer AL, van Kooten GC and S Wang. 2003. Institutional, social and economic roots of deforestation: Further evidence of an environmental Kuznets relation? <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.198.6680&rep=rep1&type=pdf>.
- Pivello VR. 2011. The use of fire in the Cerrado and Amazonian rainforests of Brazil: Past and present. *Fire ecology*, 7(1): 24-39.
- Ruitenbeek J and Cartier C. 1998. Rational exploitations: Economic criteria & indicators for sustainable management of tropical forests. Occasional Paper No. 17. Center for International Forest Research (CIFOR), 26 pp.

Takeuchi W, Maturbongs R, Sambas E, Allison A, Kurniati H, Menzies J, Murwanto A, Novotny V, A^{uga} J, Amir M, Cholik E, Taylor G, Renyaan S, van Balen B and A Kilmaskossu. 2003. Flora and fauna survey of the Tangguh LNG site Papua Province, Indonesia. Exclusive summary. British Petroleum.

15

Toman M. 2003. The role of the environment and natural resources in economic growth analysis. Discussion paper, Resources for the Future, 35 pp.

6

Van Heist M, Sheil D, Rachman I, Gusbager P, Raweyai CO and HSM Yoteni. 2010. The forests and related vegetation of Kwerba, on the Foja foothills, Mamberamo, Papua (Indonesia New Guinea). Blumea, 55: 153-161; doi:10.3767/000651910X526889.

Inter-dependency of Forest Diversity and Service towards the Potency of Economic Development in Pegunungan Arfak Natural Reserve

ORIGINALITY REPORT

16%

SIMILARITY INDEX

16%

INTERNET SOURCES

11%

PUBLICATIONS

12%

STUDENT PAPERS

PRIMARY SOURCES

- | | | |
|---|---|----|
| 1 | Krisma Lekitoo, Hans Fence Zake, Novita Panambe, Reinardus Liborius C. "Ecological and Ethnobotanical Facet of 'Kelapa Hutan' (Pandanus Spp.) and Perspectives Towards its Existence and Benefit", International Journal of Botany, 2017
Publication | 1% |
| 2 | fountainjournals.com
Internet Source | 1% |
| 3 | ediss.uni-goettingen.de
Internet Source | 1% |
| 4 | www.tandfonline.com
Internet Source | 1% |
| 5 | Submitted to National University of Ireland, Galway
Student Paper | 1% |
| 6 | www.mdpi.com
Internet Source | 1% |

7	slidelegend.com Internet Source	1 %
8	ec.europa.eu Internet Source	1 %
9	Ballesteros, T., E. Montoya, T. Vegas-Vilarrubia, S. Giralt, M. Abbott, and V. Rull. "An 8700-year record of the interplay of environmental and human drivers in the development of the southern Gran Sabana landscape, SE Venezuela", The Holocene, 2014. Publication	1 %
10	Submitted to Queen Mary and Westfield College Student Paper	1 %
11	mafiadoc.com Internet Source	1 %
12	Submitted to Asian Institute of Technology Student Paper	1 %
13	Submitted to University of Westminster Student Paper	1 %
14	Submitted to Singapore Management University Student Paper	1 %
15	Submitted to University of Sydney Student Paper	1 %
16	sinta3.ristekdikti.go.id Internet Source	1 %

17	en.wikipedia.org Internet Source	<1 %
----	--	------

18	Arif Faisol, Indarto Indarto, Elida Novita, Budiyono Budiyono. "An Application of MODIS Surface Reflectance Product for Drought Assessment on Agriculture Area in Manukwari – West Papua – Indonesia", E3S Web of Conferences, 2020 Publication	<1 %
----	--	------

19	martinuslokbere.blogspot.com Internet Source	<1 %
----	--	------

20	www.locus.ufv.br Internet Source	<1 %
----	---	------

Exclude quotes Off

Exclude matches Off

Exclude bibliography Off

Inter-dependency of Forest Diversity and Service towards the Potency of Economic Development in Pegunungan Arfak Natural Reserve

GRADEMARK REPORT

FINAL GRADE

/100

GENERAL COMMENTS

Instructor

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8
